

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Amendment of Part 90 of the Commission's)	WP Docket No. 07-100
Rules)	
)	PS Docket No. 06-229
Implementing a Nationwide, Broadband,)	
Interoperable Public Safety Network in the)	
700 MHz Band)	
)	WT Docket No. 06-150
Service Rules for the 698-746, 747-762 and)	
777-792 MHz Bands)	

Comments of Shared Spectrum Company

Shared Spectrum Company ("SSC") respectfully submits these Comments in response to the Fourth Report and Order and Fifth Notice of Proposed Rule Making ("FNPRM") in the above-captioned matter, released on June 13, 2012.

I. Comments.

A. Background. SSC is a small business founded in 2000. Since its inception, SSC has been a pioneer in the development and deployment of Dynamic Spectrum Access ("DSA") devices employing spectrum sensing and/or geo-location techniques to share spectrum. SSC has been an active participant in the concept of spectrum sharing at the FCC and the National Telecommunications and Information Administration ("NTIA"). In fact, SSC is one of the providers of DSA devices currently tested by NTIA. By sensing available frequencies, DSA technology enables better sharing of spectrum.

As a preliminary matter, SSC notes that the President's Council of Advisors on Science and Technology ("PCAST") in July 2012 issued a Report entitled *Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth* ("the PCAST Report"). A summary of the PCAST Report is attached as Exhibit A. In the PCAST Report, the authors urge the FCC and NTIA to promote sharing in part by using dynamic spectrum sensing technology.

On Page 11 of the PCAST Report, the issue of dynamic spectrum sharing is addressed:

The technology to allow multiple users to share the same piece of spectrum, independently and without any advance knowledge of the other users, has become practical in the past ten years. What inhibits greater sharing of spectrum is not lack of technology, but regulatory and economic obstacles. The new architecture we propose does away with those obstacles and opens up Federal spectrum access to many more users. We estimate that in the best circumstances, the amount of effective capacity that can be obtained from a given band of spectrum can be increased thousands of times over current usage through dynamic sharing techniques that make optimal use of frequency, geography, time and certain other physical properties of the specific new radio systems.

PCAST Report, page 11 (July 2012).

The FCC, the PCAST Report, and the NTIA all place a high value on the benefit of sharing the limited resource known as spectrum. With our digital economy increasing the demand for more spectrum, scientists, government decision-makers, and business leaders are faced with the fact that we must better use the spectrum resources that we already possess. Toward that end, DSA technology promises to permit the more efficient use of the limited spectrum resources available to government, public safety, and

commercial users alike. SSC is proud to be at the forefront of this effort.

B. The 4.9 GHz Band. In paragraph 43 of its FNPRM, the Commission asks whether sharing should occur in the 4.9 GHz band. The FCC should continuously look for bands where sharing can take place and SSC commends the Commission for raising the issue in its FNPRM.

In particular, SSC urges the FCC to continue its activities in concert with the PCAST Report and to keep working with NTIA and other stakeholders so that whenever new spectrum sharing proposals are suggested, such as in this FNPRM, the efforts of government and spectrum users are fully aligned. In particular, SSC takes notice of a recent press article concerning a possible willingness in the Public Safety community for sharing with Critical Infrastructure Users in the 700 MHz band. According to a recent article in Urgent Communications,

Seasoned public-safety communications leader Harlin McEwen, speaking at the recent Association of Public-Safety Communications Officials (APCO) conference in Minneapolis, agreed that utilities should have access to public-safety spectrum. "We just have to come up with a way to manage that. We're willing to talk."

Utilities Angling to use Public Safety's 700 MHz Broadband Spectrum, Urgent Communications, by Tammy Parker, September 6, 2012.

As the PCAST Report concluded, spectrum sharing is necessary to meet the growth in demand for spectrum from all types of users. In fact, the FCC has already identified several possible bands in which spectrum could be shared between users of different types of applications; these bands include the TV White Spaces, the 1.8 GHz

band, and the 3.5 GHz band.¹ For example, NTIA noted in its report on an *Assessment of the Viability of Accommodating Wireless Broadband in the 1755-1850 MHz Band*, that “Spectrum sharing is a vital component of satisfying the growing demand for access to spectrum and that both federal and non-federal users will need to adopt innovative sharing techniques to accommodate this demand.”

C. The Role of Dynamic Spectrum Access. In Paragraph 43 of the FNPRM, the Commission asks whether a sharing “mechanism [should] be based upon dynamic access control using a database similar to the TV White Spaces database?” SSC notes that if the decision is made by the FCC to permit sharing the 4.9 GHz band between Public Safety and others such as CII users, then the DSA technology developed by SSC could play a valuable role in permitting the sharing to occur on a more confident basis than if a database alone were to be deployed.

SSC believes that a “TV White Spaces” database approach to sharing is only part of the answer: DSA technology allows radios to sense available channels in real space and time environments. No matter how accurate a computer database full of licensee information may be, the real-world environment adds a level of granularity that can help radio users avoid interference. Whenever a database approach is adopted, such as the TV White Spaces proceeding, SSC believes that effective sharing should include the use of DSA technology in order to provide a higher level of confidence beyond just the database approach.

¹ As Exhibit B illustrates, the Commission on September 12, 2012 committed to implementing sharing techniques in the 3.5 GHz band this calendar year.

The PCAST Report notes that such a comprehensive approach is available:

The availability of both geolocation databases operating almost in real time along with cognitive radio capabilities (i.e., sensing, dynamic spectrum access), working separately or in combination, make opportunistic access feasible on a band-by-band basis, subject to conditions ("terms of use") that are tailored to avoid harmful interference to licensed operations. The integration of technologies including an automated geolocation database, sensing, signal beacons (which can be used in certain bands to immediately preempt Secondary Access and/or General Authorized Access users) and the band-by-band access rules established by the NTIA and FCC, should constitute a comprehensive access system to enable and manage shared access to most Federal bands.

PCAST Report, page 23.

SSC urges the Commission, -- and those licensees asked to share spectrum in the future with other users -- to deploy DSA technology in tandem with relational databases. By doing so, the would-be sharing parties get the benefit of two layers of protection against harmful interference: a database and a sensing technology in the radio itself.

In general, SSC is concerned that using just a database to share any band would naturally result in an overly conservative restriction zone, blocking potential sharing in an area which is geographically larger than necessary. Adding DSA technology allows the sharing relationship to become more precise, bringing efficiency to sharing that otherwise would not exist.

While SSC believes that DSA sharing alone would be appropriate in most cases of spectrum sharing, SSC recognizes that the FCC has become comfortable with databases as a way to apply a first level of analysis to sharing of spectrum bands. SSC

believes the FCC should take the second step of requiring DSA technology to be deployed in those bands in which sharing is permitted. The PCAST Report lends support to SSC's viewpoint that the database should be supplemented with real world sensing such as DSA technology:

Sensing and Dynamic Frequency Selection

Although we envision that the database will be the core technical element by which the SAS manages spectrum sharing, a separate, complementary set of technologies can accurately sense and adjust to the actual radiofrequency environment in compliance with pre-programmed "policies" designed both to protect Federal Primary Access users and to deliver uninterrupted connectivity across multiple spectrum bands. The relevant concepts are variously referred to as "dynamic spectrum access," "cognitive radio," and "policy radios." These names are largely interchangeable and "basically describe radios and radio networks that can react and self-adjust to local changes in spectrum use or environmental conditions, to obtain access to spectrum without causing harmful interference."

The FCC's Spectrum Policy Task Force recognized as long ago as 2002 that the cognitive radio technologies already being tested at DARPA and other labs would greatly enhance "opportunistic" access to unused spectrum:

"Often technologies such as software-defined radio are called 'smart' or 'opportunistic' technologies because, due to their operational flexibility, software-defined radios can search the radio spectrum, sense the environment, and operate in spectrum not in use by others... That is, because their operations are so agile and can be changed nearly instantaneously, they can operate for short periods of time in unused spectrum."

A basic feature of cognitive or policy-based DSA devices is that they operate only in accordance with prescribed policy constraints, which can be specified on a band-by-band basis. Moreover, the controlling software can be updated long after the devices are sold to end users. Conditions governing access to certain bands can be soft-wired into the device itself as well as into a geolocation database—and both can be regularly updated.

PCAST Report pages 105-106 (footnotes omitted).

By combining database and DSA technologies, the objectives of the PCAST Report can be fully realized:

The ultimate goal is to achieve dynamic heterogeneous spectrum sharing, in which spectrum users can co-exist closely in frequency, time, and geography, dynamically adapt to both the environment and the presence of other users. . .

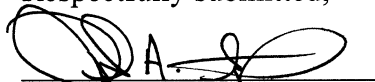
PCAST Report, page 30.

II. Conclusion.

In sum, SSC urges the Commission to establish DSA as a valuable tool for promotion of spectrum sharing in the 4.9 GHz band and in any other bands where sharing is possible. SSC believes that whenever the Commission looks to create a database as a first step to sharing, the FCC should take the second step and implement real world DSA technology.

As Americans learn to better use our limited resources of spectrum, we will benefit from increased knowledge and cooperation among diverse groups of users of those limited resources. Dynamic Spectrum Access (DSA) is one such technology that can benefit our society both today and for generations to come.

Respectfully submitted,



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Exhibit A

Executive Office of the President

FACT SHEET: Freeing up Spectrum for Wireless Broadband

July 20, 2012

Americans are using more and more wireless devices for work, social networking, entertainment, and other purposes, with global mobile data volumes more than doubling every year for the past four years. This has resulted in a growing demand for access to regions of the wireless spectrum now held by government agencies or private entities for other purposes.

Responding to this demand is important. Access to mobile information through wireless smartphones, tablets, and other devices is increasingly essential to daily life, and commercial wireless applications for healthcare, energy, homes, and transportation are a major driver of economic growth. At the same time, U.S. Federal spectrum needs are rising for a range of activities including maritime mobile satellite and radio navigation, space and satellite communications, missile detection and surveillance radar, and Forest Service communication for law enforcement and wildfire tracking.

In a new report, the President's Council of Advisors on Science and Technology (PCAST)—an independent council of experts from industry and academia—concludes that the traditional practice of clearing and reallocating portions of the spectrum used by Federal agencies is not a sustainable model for spectrum policy. PCAST finds instead that the best way to increase capacity is to leverage new technologies that enable larger blocks of spectrum to be shared.

One advantage of sharing is that it does not require licensed businesses and government entities to fully clear certain wavelengths already in use—a process that can be time consuming and expensive.

“The norm for spectrum use should be sharing, not exclusivity,” the new PCAST report concludes, noting that a new spectrum architecture and a corresponding shift in practices could multiply the effective capacity of the spectrum by a factor of 1,000. “Spectrum should be managed not by fragmenting it into ever more finely divided exclusive frequency assignments, but by specifying large frequency bands that can accommodate a wide variety of compatible uses.”

The PCAST report notes that existing approaches to spectrum sharing can be augmented by a variety of means, including dynamic redirecting of devices to available frequencies and better prevention of interference among signals in close proximity to one another.

Several such approaches are in development and a number are ready for real-world testing.

Among its major recommendations are that the Federal Government should share underutilized Federal spectrum to the maximum extent possible and identify 1,000 MHz of Federal spectrum as part of an effort to create “the first shared-use spectrum superhighways”; authorize and implement, in collaboration with industry partners, a Federal Spectrum Access System (SAS) to serve as an information and control clearinghouse for the band-by-band registrations and conditions of use that will apply to all users with access to each shared Federal band under its jurisdiction; establish methodologies for spectrum management that consider both transmitter and receiver characteristics to enable flexible sharing of spectrum; and take steps to implement a mechanism that will give Federal agencies incentives to share spectrum.

Administration Focus on Supporting Wireless Growth to Boost the Economy

The Administration is already taking a number of steps to increase availability of spectrum for new and innovative applications. Indeed, more than two years ago the President directed Federal agencies to make more spectrum available for wireless broadband use, and significant progress has already been made toward this end. Some highlights:

- June 2010: A Presidential Memorandum directed NTIA to identify 500 MHz of Federal and commercial spectrum that could be repurposed to wireless broadband within 10 years on either an exclusive or shared basis. NTIA convened the Policy and Plans Steering Group (PPSG), a high-level interagency group representing Federal spectrum users, to address the challenge. NTIA also sought support from the Commerce Spectrum Management Advisory Committee (CSMAC), a Federal advisory committee of non-government spectrum experts.
- November 2010: Based on the focused efforts of the PPSG over just a few months, NTIA identified 115 MHz of spectrum that can be shared with commercial providers of wireless broadband within five years (1695 – 1710 MHz and 3550 – 3650 MHz). In a separate report, NTIA described its methodology for reviewing additional Federally-held spectrum bands to reach the 500 MHz goal within 10 years.
- April 2012: Following further analysis in consultation with the PPSG, NTIA identified an additional 95 MHz of “beachfront” spectrum in the 1755 band (1755 – 1850 MHz) that can be made available in stages, on a shared basis, starting in five years. NTIA also commenced review of an additional 195 MHz of spectrum in the 5 GHz range.
- May 2012: Under NTIA and CSMAC oversight, Federal agencies and the commercial wireless providers established five working groups to share information and analyses regarding Federal systems in the 1755 band and proposed commercial uses so as to expedite commercial entry.

The pursuit of the 500 MHz goal is part of a broader array of Federal efforts to spur wireless innovation:

In February, the President signed legislation that: (1) expands the FCC’s authority to make more spectrum available via incentive auctions; (2) protects the FCC’s discretion to make spectrum available for innovative unlicensed uses, like wifi; (3) gives Federal agencies greater incentives to make spectrum available for commercial use by allowing them to use auction proceeds to invest in upgraded wireless capabilities; (4) will establish a wireless public safety network that will include excess spectrum capacity available for commercial use; (5) and will raise auction revenues for deficit reduction.

In addition to designing the upcoming incentive auctions, the FCC is pioneering the use of “White Spaces” spectrum sharing technology, removing regulatory barriers to the use

of spectrum for broadband in several bands, and modernizing the rules for wireless backhaul by freeing up more spectrum to connect mobile networks to the Internet. The FCC also is reforming the universal service fund, including with the establishment of a mobility fund that will target support to wireless broadband.

Exhibit B

**FOR IMMEDIATE RELEASE:
CONTACT:**

September 12, 2012

NEWS MEDIA

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**FCC CHAIRMAN JULIUS GENACHOWSKI ANNOUNCES PLANS TO
INITIATE
FORMAL STEPS ON SPECTRUM RECOMMENDATIONS FROM THE
PRESIDENT'S COUNCIL OF ADVISORS ON SCIENCE AND TECHNOLOGY
(PCAST)**

Today, FCC Chairman Julius Genachowski joined PCAST members Eric Schmidt and Mark Gorenberg at Stanford University. Specifically, he announced that the FCC will, by the end of the year, initiate formal steps to implement the key recommendations of the PCAST report, including small cell use in the 3.5 GHz band. Freeing up spectrum in this band will add 100 megahertz to our nation's wireless broadband networks.

FCC Chairman Julius Genachowski said, "Today's iPhone announcement and last week's release of the new Kindle Fire, Windows 8/Nokia Phone, and Droid RAZR by Google/Motorola offer the latest evidence that, over the past few years, the U.S. has regained global leadership in key areas of communications technology. These high-performance devices, and the demands they place on our broadband networks, underscore a critical challenge."

"Today, I announce the FCC will initiate formal steps by the end of the year to implement key recommendations of the President's Council of Advisors on Science and Technology report around freeing up spectrum in the 3.5 GHz band. This action will represent a major innovation in spectrum policy that will in turn enable innovations in wireless applications throughout the economy, including energy, healthcare, education, and other uses yet to be discovered."

-FCC-